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## **RECORD OF ORAL HEARING**

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

*Ex parte* TAE-SUNG KIM and KYUNG-JIN YOO

Appeal 2009-002505  
Application 10/767,281  
Technology Center 2800

## Oral Hearing Held: August 6, 2009

Before MARC S. HOFF, CARLA M. KRIVAK and THOMAS S. HAHN,  
Administrative Patent Judges.

## ON BEHALF OF THE APPELLANTS:

ROBERT E. BUSHNELL, ESQ.  
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The above-entitled matter came on for hearing on Thursday, August 6, 2009, commencing at 2:12 p.m., at the U.S. Patent and Trademark Office, 600 Dulany Street, Alexandria, Virginia, before Jan Jablonsky, Esq. Public.

1           JUDGE HOFF: Good afternoon. Could you state your name for the  
2 record, please?

3           MR. BUSHNELL: If it please the panel, my name is Robert E.  
4 Bushnell, and this application belongs to -- this would be Samsung SDI  
5 Company, Ltd.

6           JUDGE HOFF: You have 20 minutes. You may begin.

7           MR. BUSHNELL: The issues are well formed here. We identified in  
8 our background discussion the Tanaka reference. And Tanaka I believe, we  
9 said, discloses electrodes of titanium nitride, aluminum, titanium nitride,  
10 titanium aluminum, and titanium nitride and aluminum. But the difficulty  
11 with Tanaka -- this is on page 3 of our original spec -- he doesn't actually  
12 address or suggest a solution of the problem of aluminum what's called  
13 electromigration.

14           This is an electrical board, is that correct?

15           JUDGE KRIVAK: Yes.

16           JUDGE HOFF: Yes.

17           MR. BUSHNELL: Electrical panel?

18           JUDGE HOFF: Yes, sir.

19           MR. BUSHNELL: Okay. Tanaka didn't recognize the problem of  
20 pure aluminum diffusing into this semiconductor layer of a transistor during  
21 the heat treatment process. What's key here is that heat treatment process.

22           Now these were basically apparatus claims, except for claim 21; but it  
23 always used to bother me in criminal defense work that nobody actually ever  
24 told the Court what the facts were. They were always kind of stylized facts,  
25 and that sort of thing.

1        Here, heat treatment is critical, and the Applicant explains on page 2  
2    that these problems of electro migration and high resistance, or relatively  
3    high resistance in the electrodes, affect the quality of the image formed on  
4    the screen of the display device.

5        So at the bottom of the paragraph 0006, they explain the heat  
6    treatment process subsequent to the formation of the metal electrode, and the  
7    conductive lines electrically connected thereto tends to worsen the metal  
8    electrode, or the quality of the metal electrode as an electrical conductor.

9        And then they say, "For example, the contact annealing process after  
10   source and drain metal sputtering is necessary in thin film transistor  
11   fabrication." And they suggest the temperature used to anneal may be  
12   higher than 300 degree Celsius.

13       Now the primary reference of Ohtani 543 doesn't really have any  
14   disclosure of a heat treatment. He's using sputtering and chemical vapor  
15   deposition processes.

16       And the Office, courtesy of Naval Ordnance Lab back in the '70s, is  
17   well aware of chemical vapor deposition. The semiconductor itself would  
18   be analogous to ceiling white paint on Abraham Lincoln's mother's log  
19   cabin, when Abe Lincoln used to write on it with carbon from a candle or an  
20   oil lamp.

21       What the trick is, the ceiling's cool relative to the chemical vapor  
22   deposition source -- so it precipitates upside down on the ceiling.

23       That's still true, it's always been true, whether it's upside down or  
24   visa-versa. But Richard Schooler demonstrated down at Naval Ordnance  
25   Lab, and he certainly had enough cases issued, that demonstrated you can

1 vary the precipitation or so forth by fooling around very gently with the  
2 temperature of the substrate.

3 My point is you don't subject the substrate to heat treatment, certainly  
4 not at 300 degrees, when you're doing chemical vapor deposition.

5 Now the Examiner's position is that -- and I'm quoting from his  
6 Examiner's Answer -- Ohtani, the primary reference, shows all of the  
7 elements of the claims except the aluminum layer being an aluminum alloy,  
8 and the diffusion prevention layer interposed between the aluminum alloy  
9 and each of the pair of titanium layers.

10 And then he suggests going to Maeda, the secondary reference. These  
11 two references are applied to the rejection of all claims.

12 In addition, Yamazaki 575 is applied for the rejection of claims 8 and  
13 21, in order to show the complete device. We don't need to discuss  
14 Yamazaki here today.

15 Now, Maeda, according to the Examiner, shows in Figure 1 -- source  
16 drain electrode having titanium layer 32, aluminum alloy layer 36, and a  
17 titanium nitride layer 34 interposed between the titanium and aluminum  
18 alloy, to act as a barrier for blocking the aluminum diffusion, and also  
19 according to the Examiner for preventing growth of alloy spikes.

20 Now the problem with that is that there's no *prima facie* showing of  
21 obviousness. Under 103 we have to identify the differences. The examiner  
22 neglected to do that.

23 The Applicant defines basically using claim 1 as an example: "An  
24 aluminum alloy layer disposed between a pair of titanium layers and a

1 diffusion prevention layer interposed between the aluminum alloy layer and  
2 each of the pair of titanium layers."

3 At best, the Examiner is citing -- I believe he's citing columns 3 and 4  
4 of Maeda. He has a three-layer structure.

5 Now why is that significant? As per line 40 of column 4 of the  
6 secondary reference, it's after annealing, the aluminum silicon layer 37 is  
7 formed on layer 34.

8 What's missing here, or what he's done is substitute basically a  
9 four-layer structure at best, which doesn't have an aluminum alloy layer  
10 disposed between -- a pair of titanium layers -- aluminum silicon I think we  
11 will agree is not titanium -- and he's also missing the second to the pair of  
12 diffusion prevention layers.

13 Third, he's actually depositing that after the annealing step --

14 JUDGE HAHN: Sir?

15 MR. BUSHNELL: Yes?

16 JUDGE HAHN: Excuse me. I'm following what you're saying.  
17 Could you cite to your Appeal or Reply Brief where this argument is set out?  
18 And what I am saying by argument concerns a pair of titanium layers  
19 sandwiching the aluminum layer.

20 MR. BUSHNELL: Okay. I can do that. And from time to time the  
21 Board asks me to do that. It does take time, and my request is you'd grant  
22 me extra time to do that.

23 JUDGE HOFF: Very well.

24 MR. BUSHNELL: Very well. Okay.

1        Okay. If you start, I guess on page 6 of our Brief, and include the last  
2 paragraph that spans 6 and 7 for the pair of titanium layers.

3           JUDGE HAHN: That's in your Summary of the Claimed Subject  
4 Matter. But in your Argument, I missed it in your Argument. I did not find  
5 that in your Argument.

6           MR. BUSHNELL: Well, we had to actually string together several  
7 paragraphs to regurgitate an argument, the express limitations of the claims.  
8 There had been complaints over the years that our arguments were too long,  
9 and we tried to shorten them by just focusing on the deficiencies or the  
10 differences under 103(a) that should have been considered.

11          But let me read one here. Okay, that's that. And if you go to the  
12 Reply Brief.

13          What I'm addressing here today is actually the Reply Brief to the  
14 Examiner, which raises issues that weren't raised during the prosecution.  
15 Let me go to that.

16          JUDGE HOFF: You mean the Examiner's Answer?

17          (Discussion was held off the record.)

18          MR. BUSHNELL: Yeah. What I'm really addressing here is page 4  
19 of the Examiner's Answer, where we're discussing these details of the  
20 electrodes.

21          Yeah. Okay. On the Reply Brief, at the bottom of page 2 -- and  
22 again, remember the Board's been threatening us with a page limit on these  
23 briefs in the proposed rules, so --

24          JUDGE HOFF: Which is not currently in force.

1           MR. BUSHNELL: Well, we talk about Ohtani's three-layered  
2 laminated structure, titanium, aluminum, titanium. And then going down  
3 towards the -- wait a minute, yeah, top of page 3, and then at the bottom of  
4 page 3, even assuming that Maeda teaches the use of a seven-aluminum  
5 alloy layer instead of aluminum, at best Maeda teaches a four-layer  
6 structure.

7           And what he's missing is the titanium and the titanium interposed  
8 nitride. And the reason that's important is Applicant uses a heat treatment or  
9 annealing afterwards. Maeda does the heat treating or annealing before.

10          And you can see that better in Maeda's example. He's got a different  
11 embodiment, that he discusses on page 5 with respect to Figures 3(a) and  
12 3(b), where he says he has the four-layer structure in which titanium silicide  
13 layer 52 is formed on top of the aluminum layer 36.

14          And I assume that's independent of what the composition of the  
15 aluminum layer 36 is.

16          And wait a minute, that's a vacuum deposition growth. So what's  
17 missing here is the recognition that downstream of that growth process, you  
18 have the problem addressed on paragraph 0006 of Applicant's original  
19 specification, heat treatment subsequent to the formation of a metal  
20 electrode, and conductive lines electrically connected thereto.

21          That's nowhere recognized in any of these references. There are  
22 earlier references, and it's not unexpected that these references don't have  
23 this recognition -- in view of, I guess, the annual R&D budgets of several  
24 million dollars for these processes to get the processes running perfectly.

1        So what we've got here are the differences that were required to be  
2 recognized by 103(a). We have to weigh those, and when we don't even  
3 have a prima facie discussion or suggestion of the structure explicitly  
4 defined by the independent claims.

5        But we have an advantage flowing from those differences, mainly the  
6 ability to anneal this, particularly when you're doing contact annealing  
7 processes, temperatures higher than 300 degrees Celsius, we've got indicia  
8 of patentability.

9        Okay. And I believe that's all we need to address today.

10      JUDGE HOFF: Any questions --

11      MR. BUSHNELL: It seems what we've got here -- and I've noticed  
12 this in other cases -- there's a thumb on the scale of obviousness, engaging  
13 obviousness. Somebody's putting their thumb on the scale and then telling  
14 the examiner "No".

15      I've had examiners tell me that in other cases. I haven't spoken to this  
16 Examiner. But according to the Examiner's reasoning, and the use of  
17 aluminum either as an alloy or otherwise, and any cleaving on the side of  
18 that aluminum layer with titanium and titanium nitride, negates patentability  
19 of any further tinkering with that.

20      Which is what inventors do. Time and again, the  
21 inventor -- sometimes I bring them in for interviews, and the examiner has  
22 one question. If we look at your number two patent and your number four  
23 patent, why wouldn't it be obvious to interchange those?

24      And in that case, the Examiner told me he didn't need to see any  
25 other -- because that inventor was the best in the world. The Inventor's

1 answer was, "I asked myself the same question. Why did it take me four  
2 years to recognize I could do this?" Get the same product, a better result by  
3 interchanging these parts from two different references of his own work.

4 No question they were bars they'd issued long before. But it took the  
5 inventor four years.

6 Here what we have is one more efforts to perfect the TFT production  
7 process.

8 These are big plants, they're multi-billion-dollar plants, and they  
9 locate them in different places around the world. So it's quite a significant  
10 investment.

11 Thank you, Your Honor.

12 JUDGE HOFF: Thank you.

13 (Whereupon, at 2:28, the proceedings were concluded.)